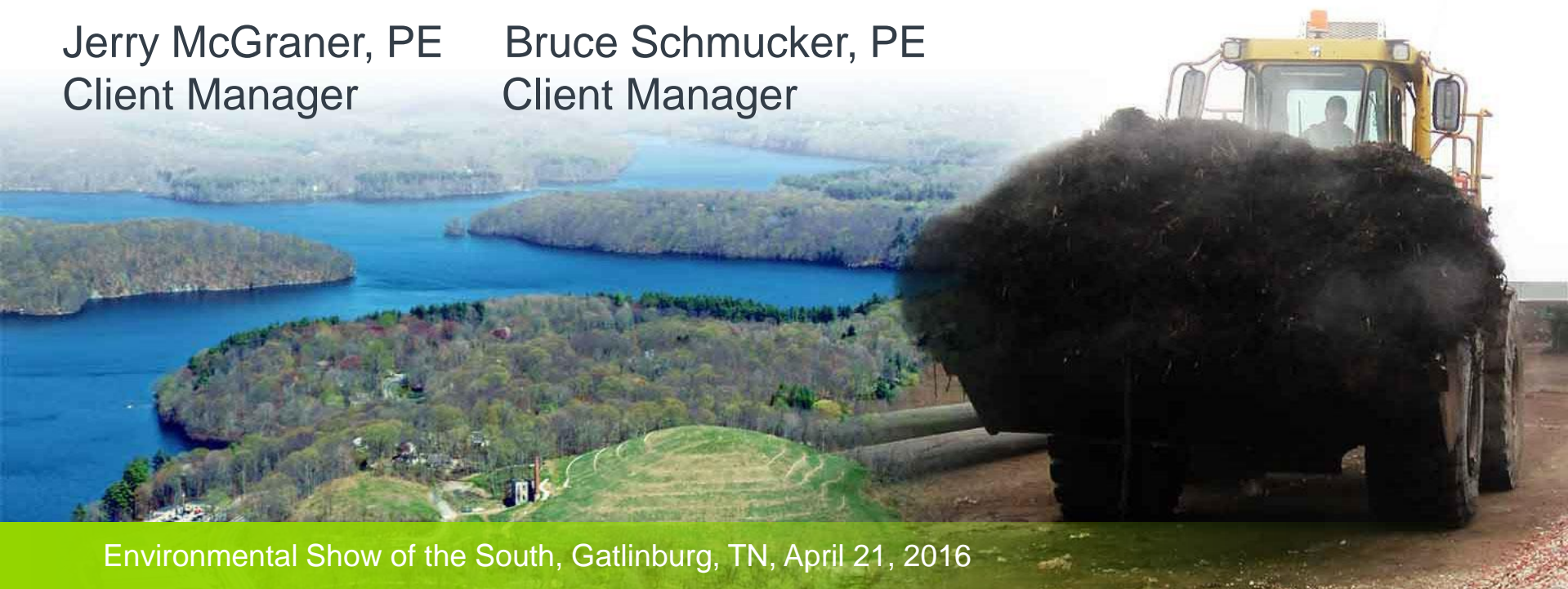


Coal Ash: Nowhere to Go

Anticipated Impact of CCR Regulations

Jerry McGraner, PE
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What Are Coal Combustion Residuals

- Coal Combustion Residuals (CCR) Include:
 - Fly Ash – Fine particles generated (captured emission controls)
 - Bottom Ash – Heavy granular material (bottom of boiler)
 - Synthetic Gypsum – By product of FGD Emission Controls



Up Until Now ...

- Disposal in Surface Impoundments and Landfills - Unlined



But Circumstances Have Changed

- TVA Kingston Fossil Plant, Tennessee 12/22/2008
- Dike Failed – over 5 million cubic yards of ash released



And More Recently...

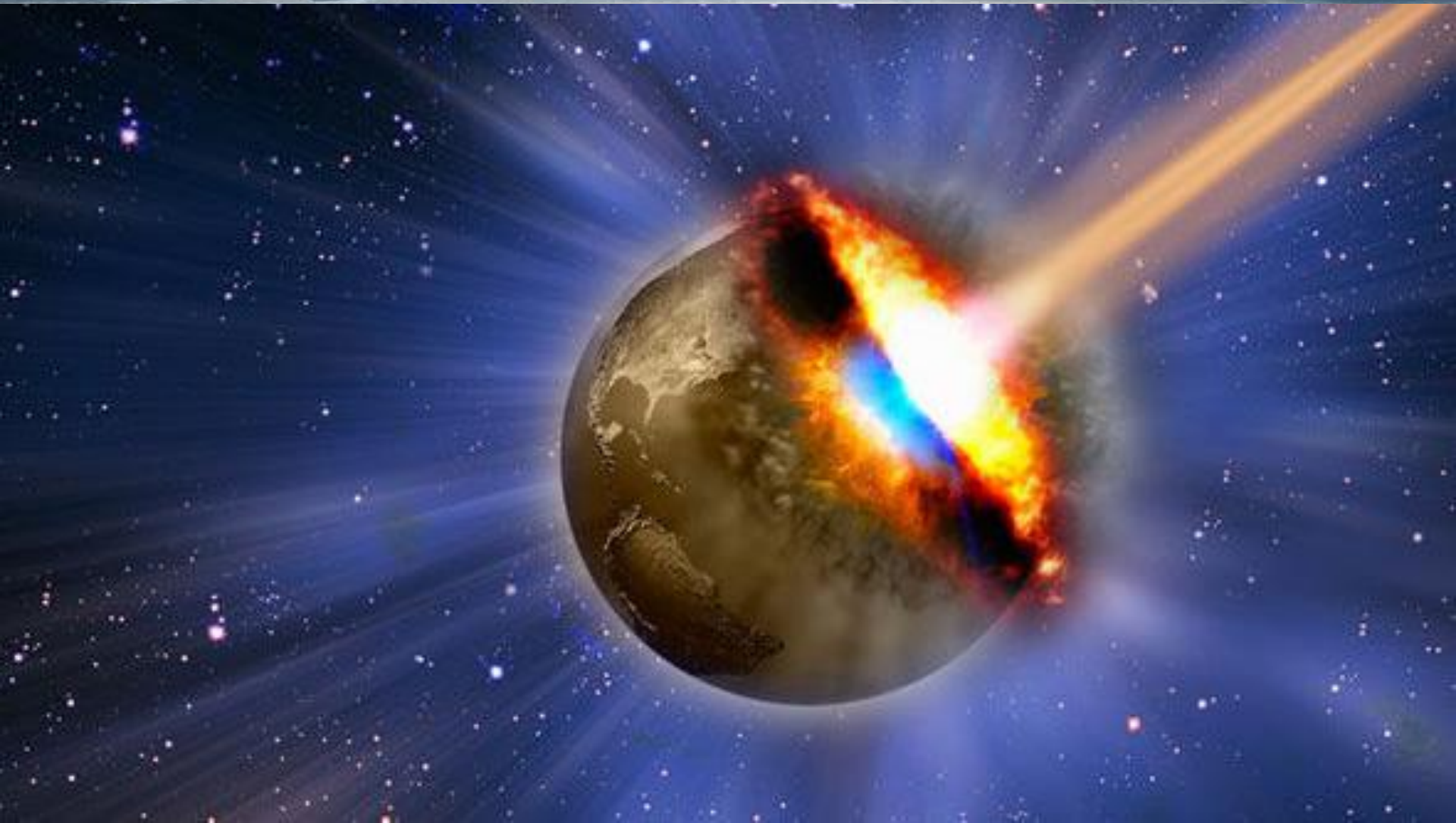
- Duke Energy Dan River Spill, North Carolina 2/02/2014
 - Pipe Failed – 80,000 tons of Ash Released and 27 Million Gallons of Contaminated Water
 - 70 Miles of Dan River Impacted



EPA – New Regulations for CCRs

- Final Rule Effective Date – October 19, 2015
- CCR Now Classified as Solid Waste – RCRA Subtitle D
- Some Requirements:
 - Siting Requirements for Existing and New (Aquifer, Wetlands, Faults, Seismic Zone, Unstable Areas)
 - Liner & Capping Systems
 - Groundwater Monitoring
 - 30 Year Post-Closure Care

What Will Be the Impact



Similar Change for Solid Waste

- October 1991 – EPA Issues Solid Waste Regulations
- Some Requirements:
 - Siting Requirements
 - Liner & Capping Systems
 - Groundwater Monitoring
 - 30 Year Post-Closure Care



So We Have Crossed This Road Before



Impact on Costs

- Composite Liner System
- Leachate Collection and Treatment
- Environmental Monitoring Costs
- Closure Costs
- 30 Year Post-Closure Care Expenses

Impact on Number of Facilities

- 1986 – Approximately 7,683 MSW Landfills
- 1991 – 5,345 MSW Landfills (Prior to final rules)
- 1995 – 3,581 MSW Landfills
- 2012 – 1,908 MSW Landfills



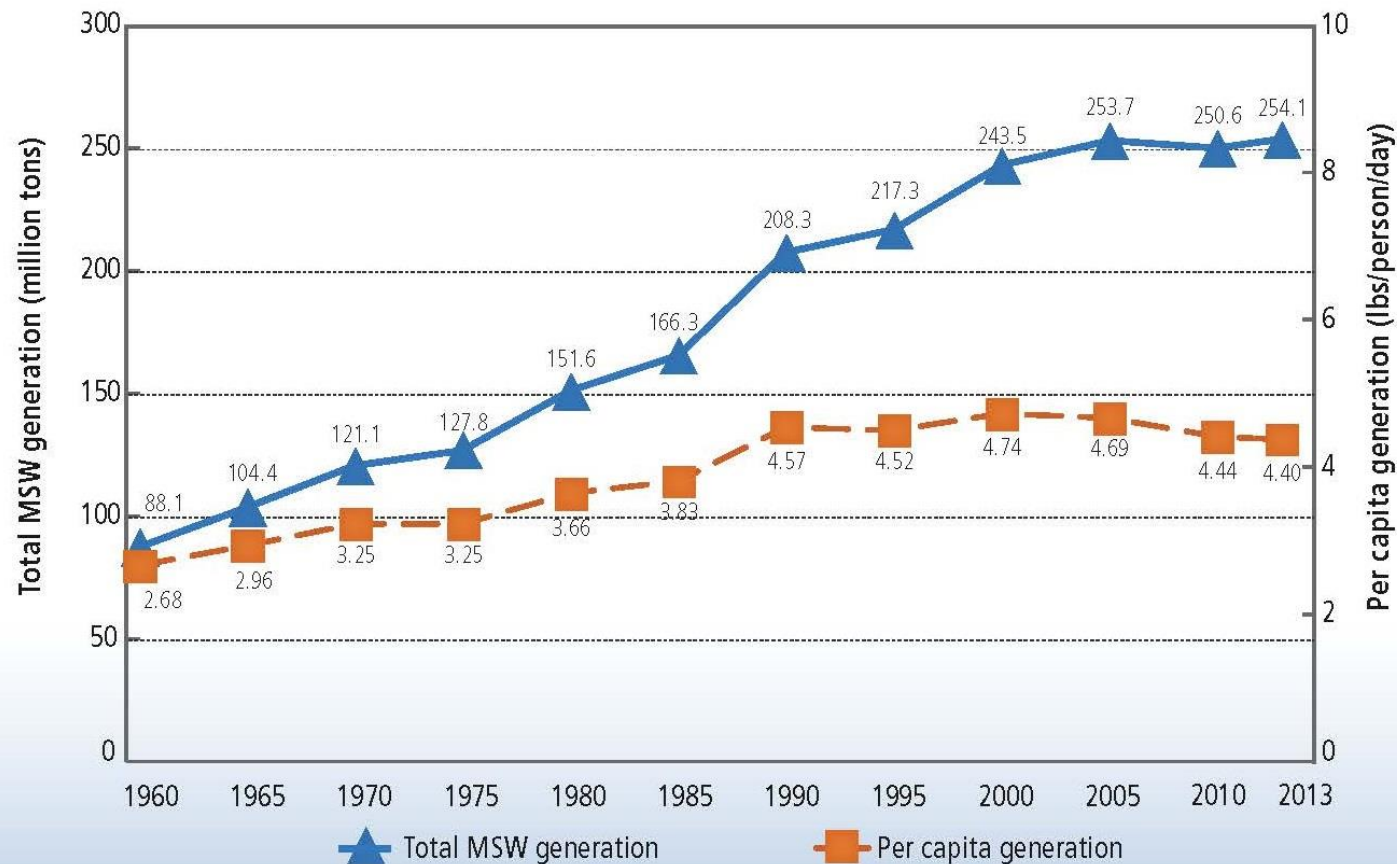
Impact on Facility Size/Control

- Costs Forced Small Facilities to Close
- Development of Regional Landfills to Serve Broader Geographical Areas and Spread Cost Over Greater Volume
- Shift from Local Government Control to Private Industry



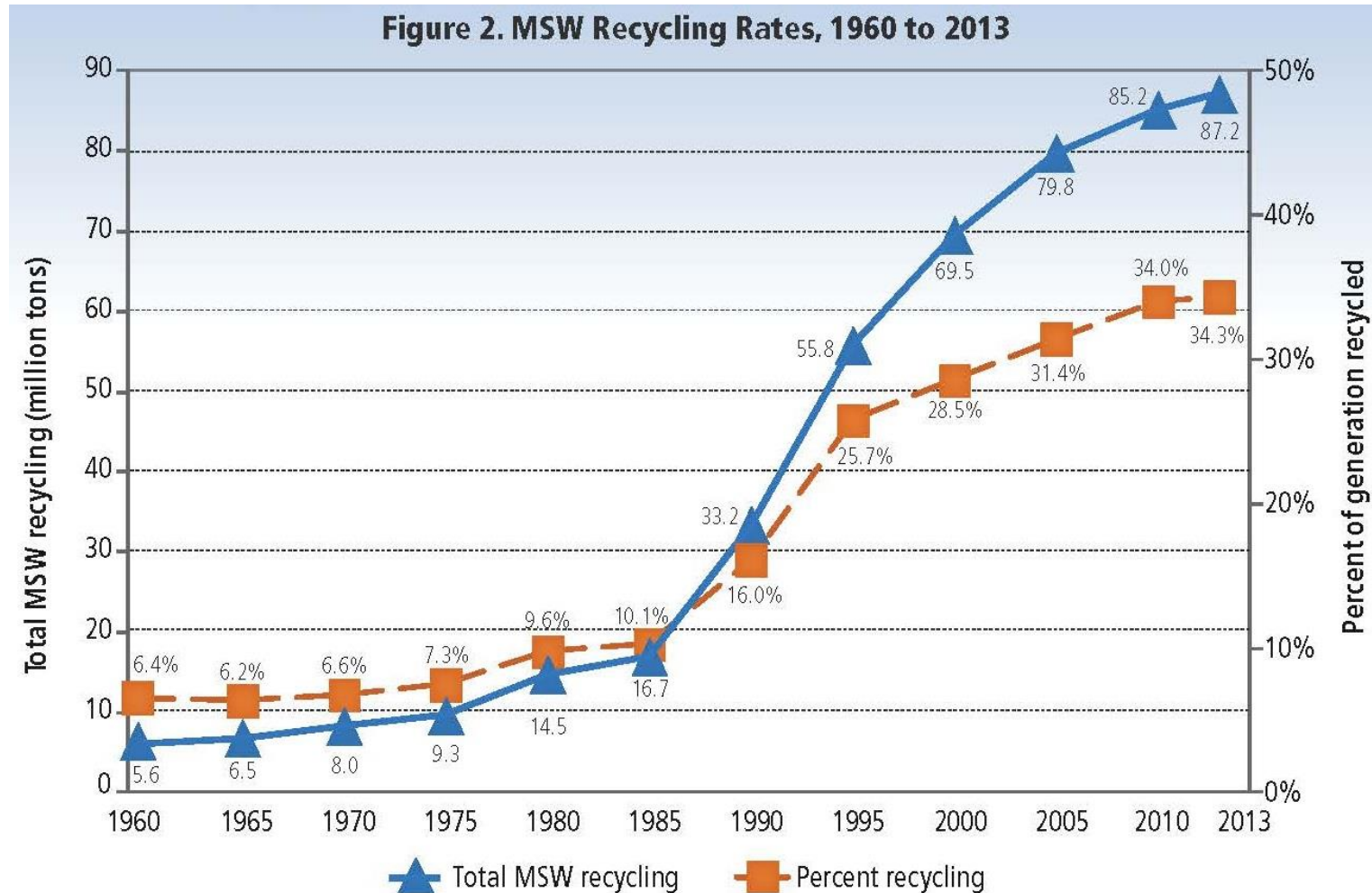
Impact on Volume

Figure 1. MSW Generation Rates, 1960 to 2013



From EPA Advancing Sustainable Materials Management 2013 Facts and Figures Report

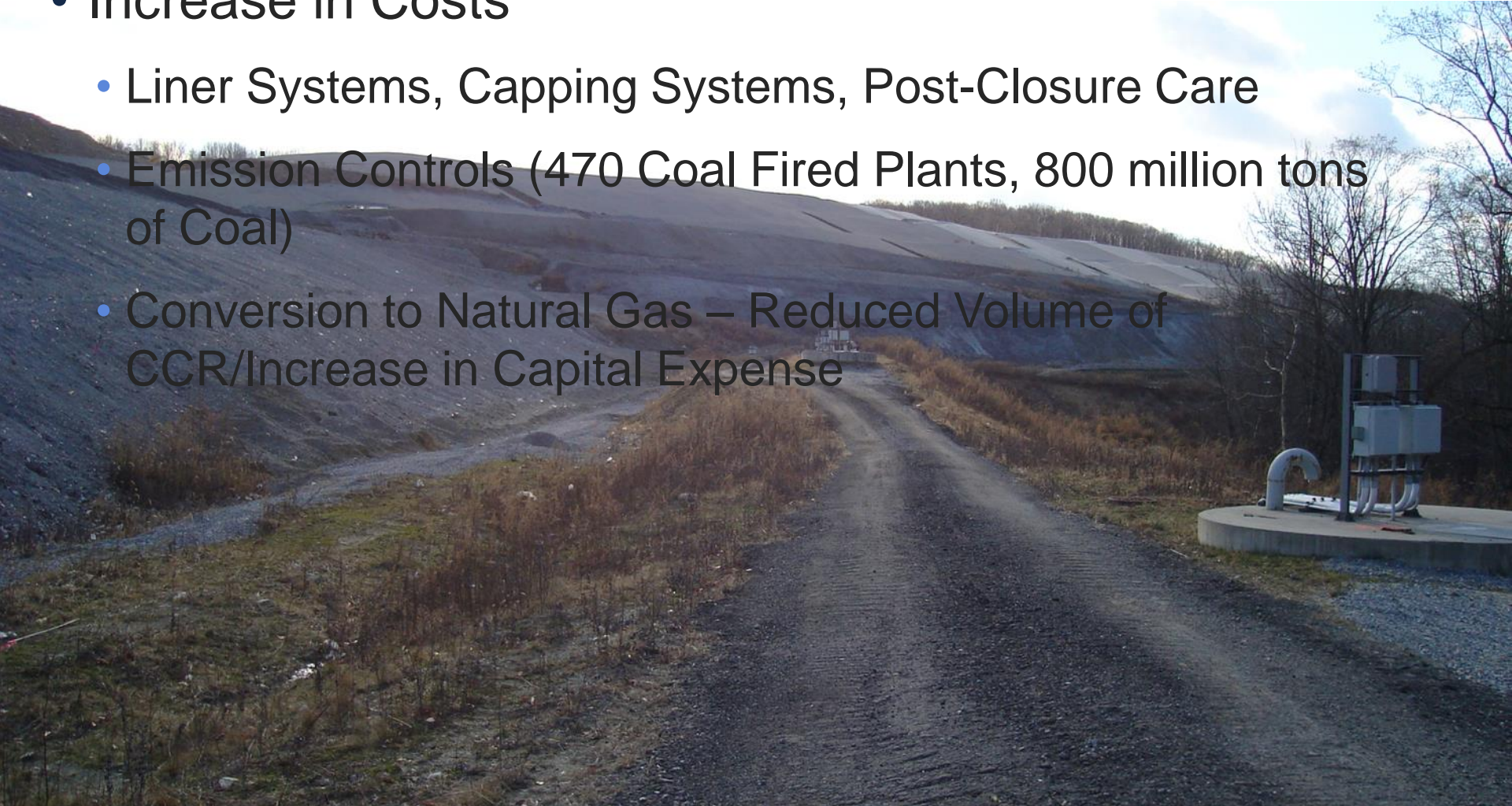
Impact on Recycling



From EPA Advancing Sustainable Materials Management 2013 Facts and Figures Report

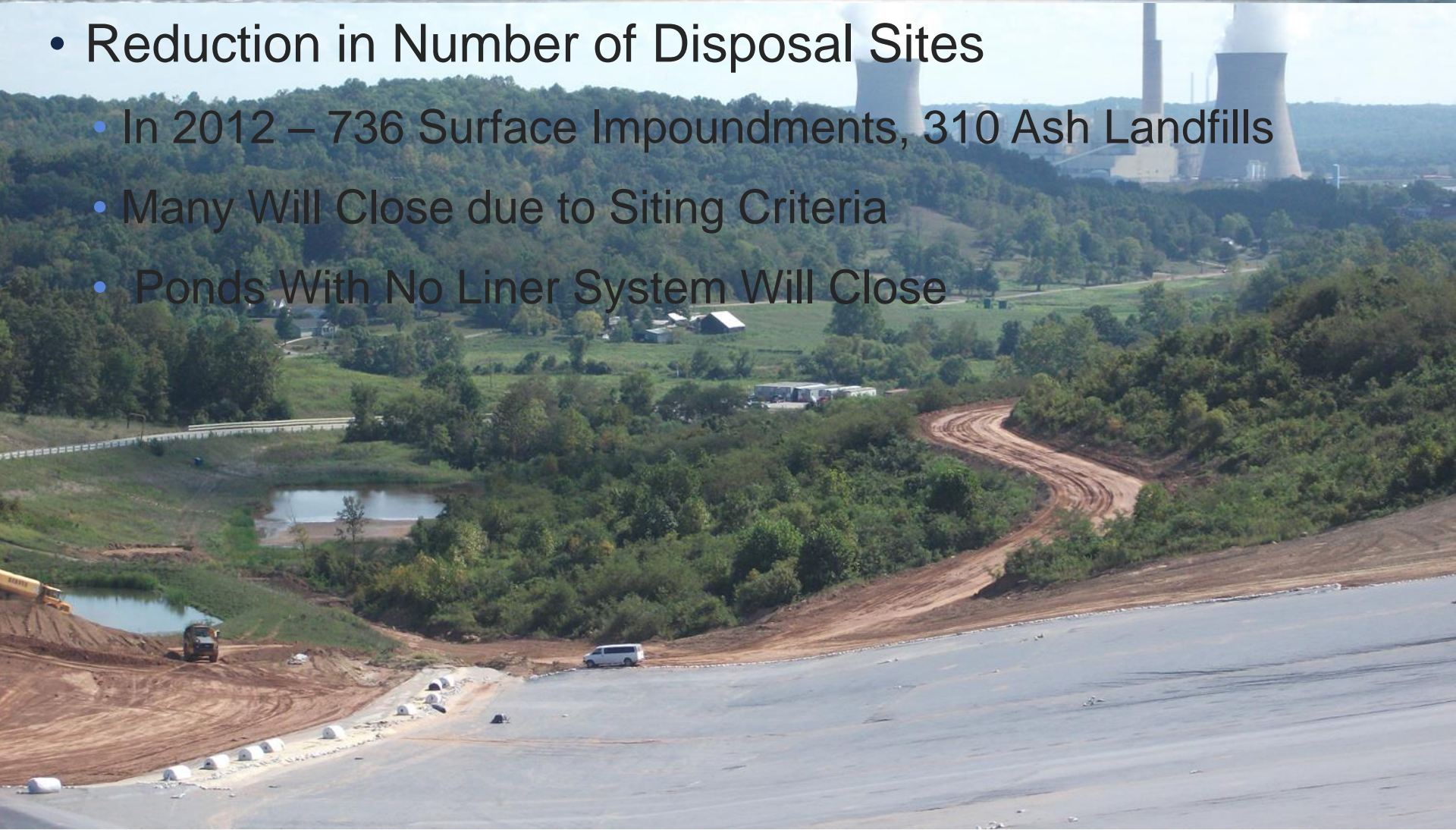
Anticipated Impacts from CCR Regulations

- Increase in Costs
 - Liner Systems, Capping Systems, Post-Closure Care
 - Emission Controls (470 Coal Fired Plants, 800 million tons of Coal)
 - Conversion to Natural Gas – Reduced Volume of CCR/Increase in Capital Expense



Anticipated Impacts from CCR Regulations (cont)

- Reduction in Number of Disposal Sites
 - In 2012 – 736 Surface Impoundments, 310 Ash Landfills
 - Many Will Close due to Siting Criteria
 - Ponds With No Liner System Will Close

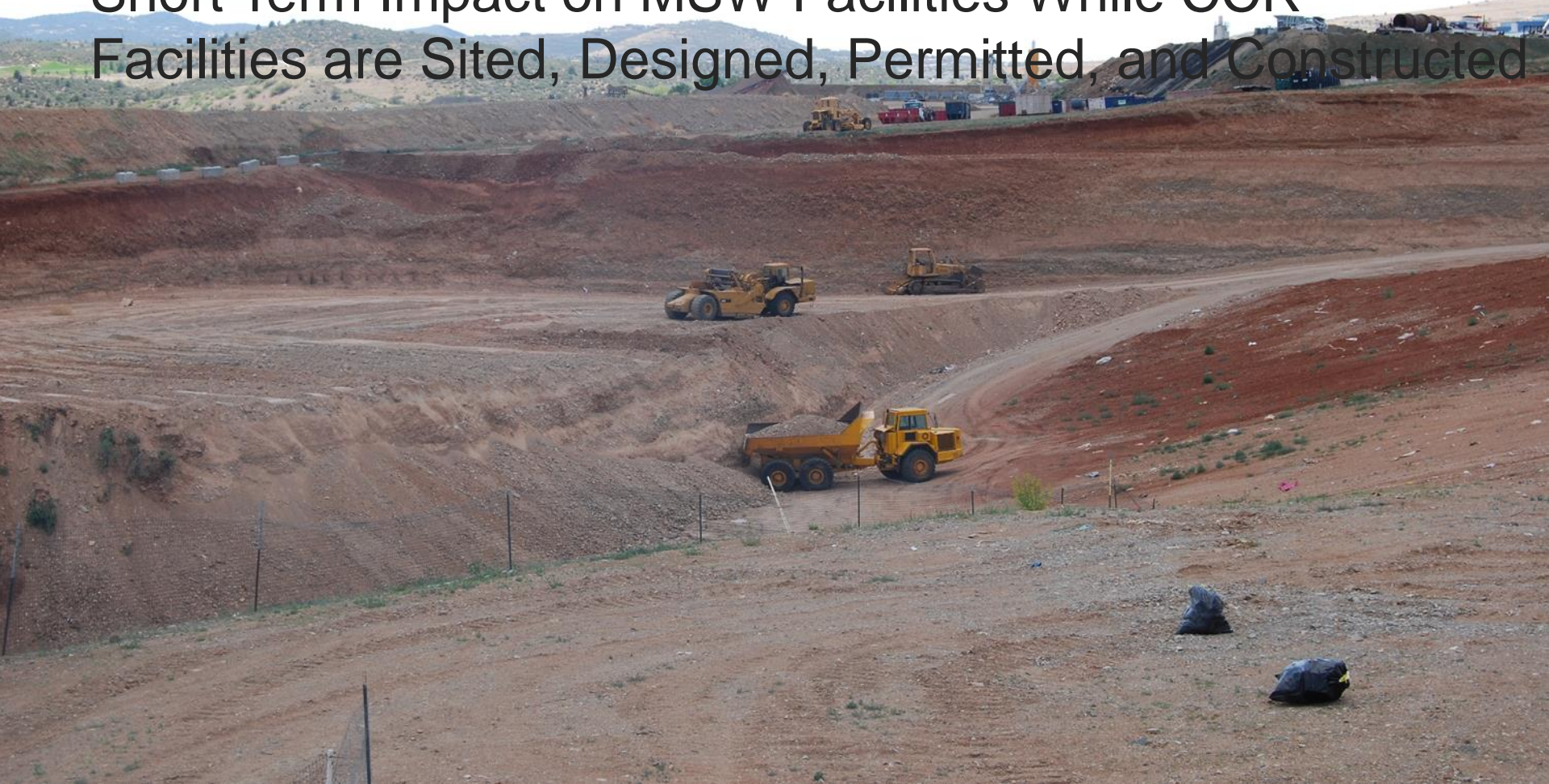


Anticipated Impacts from CCR Regulations (cont)

- Larger/Centralized Disposal Facilities will Develop
- Siting Criteria will Drive Expansion of Existing Locations and Development of New Greenfield Landfills
- Expense will Drive Larger Disposal Volumes to Distribute Cost

Anticipated Impacts from CCR Regulations (cont)

- Short Term Impact on MSW Facilities While CCR Facilities are Sited, Designed, Permitted, and Constructed



Anticipated Impacts from CCR Regulations (cont)

- Operational Expenses will Increase as Industry Changes Material Handling Procedures



Anticipated Impacts from CCR Regulations (cont)

- Possible Shift of Operations to Waste Management Companies



Anticipated Impacts from CCR Regulations (cont)

- Recycling and Beneficial Use will Increase
 - Current Uses Include:
 - Fly Ash as Concrete Additive
 - Bottom Ash as Aggregate/Leachate Collection Layer
 - Synthetic Gypsum as Drywall and Agricultural Soil Amendment
 - Over 40% of CCRs Are Recycled
 - Disposal Cost will Help Drive Innovation
 - Expand Current Use and Develop New Applications



Anticipated Impacts from CCR Regulations (cont)

- Consumer Impacts
 - Increased Electricity Costs
 - Further Job Reductions in the Mining Industry
 - Accelerated Development of Alternative Energy Sources



Summary

- Increased Costs
- Reduced Number of Sites
- Coal Ash May End up ...

With Nowhere to Go



Questions



Thank You!

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